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ABSTRACT

Data are presented to show that reinforcement and exact repetition of adult speech are beneficial but not necessary components of a modeling procedure which results in production of novel linguistic forms by children. Laboratory studies suggest the need for a re-evaluation of current hypotheses about the limited role of imitation in language acquisition. (Author/CK)

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Laboratory studies of imitation and language acquisition: Is there an interface with the normal environment? [1]

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Few if any topics in the last decade have captured the attention of psycholists so much as the question of the processes responsible for language acquisition. A critical issue within this area concerns the role of modeling and imitation in the acquisition and usage by children of new grammatical forms. Recent observations by psycholinguists of language development as it occurs in the normal environment have led some investigators to question whether imitation plays any role in language acquisition. Let me review briefly the evidence that has led to this assertion.

(1) First, it is noted that most human speech, including that of children, is novel in the sense that word sequences are seldomly repeated. It is argued that since child speech is seldom an exact copy of adult speech, imitation could not be involved in language acquisition.

(2) Second, it is asserted that spontaneous imitative speech is not more advanced grammatically than non-imitative speech as it would have to be if it plays a progressive role. This statement is based on the well known study by Ervin (1964) that showed that spontaneous imitative responses defined as more or less immediate and exact copying of adult speech, can be handled with the same grammar that describes the child's spontaneous utterances.

(3) Third, imitative responses, once again defined as attempts at immediate and exact copying, occur with frequency between the ages of two and three but decline dramatically thereafter, even though the language of the child continues to develop in complexity (Slobin, 1968).

(4) Fourth, reinforcement, which is closely tied with the imitation process in some theoretical approaches, does not appear in the normal environment to be contingent upon grammatical aspects of speech. Here, I have reference to the well known work of Roger Brown and his associates (Brown, Cazden, and Bellugi, 1969).

Arrayed against these observations of the normal environment which seem to eliminate or restrict the role of imitation in language acquisition, are

a series of laboratory studies which suggest that modeling and imitation can exert powerful leverage on the language productions of children. The question raised here is this: Is there any interface between these laboratory studies and the language acquisition process as it normally occurs?

Before attempting a tentative answer to this question based on some recently completed research, it is necessary to briefly review some earlier studies, particularly as they relate to the four observations previously noted. Two lines of research are relevant. The first has been based on a technique called imitation training which has been employed by several operant psychologists.

SLIDE #1

Presented here are the generalities of this procedure as it might be used to train a child to use prepositional phrases. Two sets of stimulus pictures would be presented to the child over a series of sessions. The child would be asked to tell about both sets of pictures. When his responses to the training pictures did not include prepositional phrases, he would be reprimanded and the adult would provide a model of a sentence containing a prepositional phrase. The same picture would then be presented again. A response by the child at this point would usually be imitative of the model provided by the adult and the child would be praised. When the child is asked to respond to probe pictures, his response would be recorded with no modeling or feedback.

As procedures such as this continue, very interesting behavior emerges. The child begins to respond to the probe pictures with the grammatical structure that is being modeled for him with respect to the training pictures

but he uses content words that are appropriate to the probe pictures. Thus, novel responses on the content dimension are produced which are imitative on the structural dimension. I have labeled this phenomenon selective imitation to differentiate it from exact mimicry.

Imitation training procedures similar to those described have been shown to result in acquisition of new grammatical forms. The work of Doug Guess and his associates with retarded children is the earliest and best known of this research (e.g. Guess et.al., 1968). In my own laboratory this work has been extended to acquisition of novel and grammatical two word utterances by very young normal children (Whitehurst, 1971, 1972).

How does selective imitation as a result of imitation training relate to the four "facts" of normal language acquisition previously cited? First it indicates that there is no incompatibility between imitation and novel speech. In selective imitation, we see that speech sequences can be simultaneously imitative and novel. Second, the observation that imitation is not grammatically progressive is seen to be irrelevant due to the fact that imitation was defined in the Ervin study as exact copying. Selective imitation is not exact mimicry and therefore would have been missed by the definition used in the Ervin procedure. However, the two remaining observations of normal language development run squarely counter to the procedures of imitation training. If children do not get reinforcement from parents for grammatical aspects of production and if attempts to mimic adult speech do not occur with frequency past the age of three, then a laboratory procedure that includes repetition of adult speech and reinforcement will not be

directly relevant to the normal process of acquisition.

At this point of seeming impasse, the second line of laboratory research becomes relevant. It is based on a procedure called modeling which does not involve exact repetition of adult speech or differential reinforcement.

SLIDE #2

Returning to the example of prepositional phrases, the modeling procedure would once again involve training pictures and probe pictures. When training pictures were presented, the adult would model sentences containing prepositional phrases without requiring or allowing the child to respond. Probe pictures would be presented just as in imitation training, with no modeling or differential feedback.

Modeling has also been shown to result in selective imitation, i.e.: imitation of the structure but not the content of the model's utterances. Studies by Bandura, Harris, Rosenthal and their associates have shown that aspects of language such as verb tense, sentence length, and question - asking style will be selectively imitated by children (e.g. Harris and Hassemer 1972). Thus it would seem that modeling as studied in the laboratory shows a complete interface with the facts of normal language acquisition. However, one critical restriction must by placed on the previous statement. To date, studies of modeling have used older children and grammatical structures

already known to be in the repertories of the children used as subjects. Therefore language acquisition has not been demonstrated to result from a modeling procedure not involving reinforcement or repetition of adult utterances. Something of a paradox is thus presented: Imitation training which results in acquisition of new forms is not compatible with observations of the normal language environment while modeling, which is compatible with the normal environment, has not been shown to result in acquisition.

Resolution of this apparent paradox was the goal of the two research studies which I will now present.

STUDY 1

Subjects for this study were four three and four year old children from a local day care center. The purpose of the study was to directly compare the effectiveness of modeling and imitation training. Four types of sentence phrases were used as target structures, participial, prepositional, appositive and infinitive. A multiple baseline single-subject design was employed. After determining the probability of "spontaneous" production of sentences containing the four phrase types in response to probe pictures, adults used either modeling or imitation training procedures in relationship to training pictures. The design called for modeling, with no reinforcement or response repetition by the child, to be used first for each phrase type. If modeling produced no effect on the probe trials or only a weak effect, then imitation training was employed.

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SLIDE #3

This slide represents the data from one representative subject, Glenn. Sessions are on the lower abscissa. The sequence of procedures to which the child was exposed are on the upper abscissa. Production by the child of the four phrase-types on probe trials is separated into four separate graphs with the percentage of probe trials resulting in sentences containing a particular phrase type being presented on the left ordinate. The stimuli to which children and adult models were responding consisted of pictures of action sequences from a children's colouring book.

What we see is that Glenn used many infinitive and prepositional phrases during baseline, prior to either modeling or imitation training. However, he never produced appositives or participials. Modeling of appositives produced a small but clear effect on probe trials. Training of appositives A and B which followed produced stronger and much more stable production of appositives on probe trials. (The differences between training appositives A and B are procedurally slight and can be ignored for present purposes.) Modeling of infinitives followed and resulted in immediate, strong, and stable selective imitation of infinitive phrases on probe trials. Modeling of participials resulted in no production of participials by the child while imitation training of participials did. Modeling of prepositions was immediately effective.

The data from the other three subjects will not be presented. It generally replicates the results seen in this slide. In summary, modeling produced strong effects when applied to sentence phrase-types already in the subjects' baseline repertoires. There was an occasional and weak effect suggesting

acquistion as a function of modeling, such as appositive modeling for Glenn. However, imitation training was by far the stronger of the two procedures resulting in strong selective imitation effects in every case in which it was applied. Thus, this study suggests that modeling may sometimes result in usage by a subject of a new grammatical form. However, it appears weak and is sometimes ineffective. One problem with the study is that there is little developmental evidence on the production of sentence phrase-types by children. Without such evidence, it is difficult to argue that the non-occurence of a phrase-type in a child's baseline necessarily means that he has never produced it. Also, the sequence effects within the multiple-baseline procedure may have suppressed the effectiveness of the modeling procedure.

STUDY #2

The second study employed a syntactic structure about which there is much developmental evidence, the passive. A group design was employed so as to avoid sequence effects. Also, only modeling was studied. Subjects were four year olds. For the experimental group, probe trials in which the subjects were asked to describe pictures such as those in the next slide were interspersed among modeling trials during which the adult model labeled similar pictures with passive sentences, e.g. "The turtle is being squirted

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SLIDE #4

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by the mouse; The mouse is being squirted by the turtle". Following five modeling sessions, comprehension of passive and active forms was tested by presenting the child pairs of pictures such as this one, saying either

an active or passive form relevant to one of the pictures, and instructing the child to point to the correct picture. Control subjects received only probe trials followed by comprehension testing.

SLIDE #5

The next slide presents the production of active and passive sentences on probe trials and the comprehension scores of the experimental group. The dotted line represents passive production, the solid line active sentences. Note that every experimental subject produced at least some passives. Also, the comprehension scores of every subject except Roger for both active and passive sentences are above chance, which is 50%. I will not present a graph of the data from the control subjects. It is easily summarized verbally. No control subject ever produced a sentence containing a passive. Comprehension scores for passives for the control subjects were above chance but significantly lower than the passive comprehension scores for the experimental subjects. There were no differences between experimental and control subjects on comprehension of active forms.

What are the implications of these data? It is important to note that the passive construction does not appear to be in the repertoires of normal four year old children. For example, Harwood (1959) found not a single instance of the passive voice in over 12,000 spontaneous utterances that he collected from a sample of normal 5 year olds. Thus, the assertion that the present procedures produced acquisition seems incontrovertible. Since the modeling procedure involved no selective reinforcement or exact response

mimicry by the child, it is completely consistent with the most stringent interpretation of the conditions of language acquisition in the normal environment. Recall the question posed in the introduction of this paper - Is there an interface between laboratory studies of language acquisition and the normal environment?

The answer suggested here is "yes". The interface is the process of modeling which results in a selective imitation of the structural aspects of adult speech. To make this statement is only to suggest the starting point for future research, for selective imitation of modeled linguistic structure clearly has prerequisites and these must be isolated. Our current hypothesis is that these prerequisites are established in the comprehension mode and that selective imitation is the process by which forms are first introduced into production. However, there is not sufficient time to elaborate this point.

In summary, the data presented here show that reinforcement and exact repetition of adult speech are beneficial but not necessary components of a modeling procedure which results in production of novel linguistic forms by children. These laboratory studies suggest the need for a re-evaluation of current hypotheses about the limited role of imitation in language acquisition.

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Footnote

1 The research reported herein was supported, in part, by Biomedical Sciences Support Grants # 31-8241-F, 31-8237-F, and 31-H022A. More detailed presentations of the two research studies and the theoretical notions about the role of imitation in language acquisition are available in the following papers:

Whitehurst, G.J. and Novak, G. Modeling, imitation, and the acquisition of sentence phrases. Journal of Experimental Child Psychology, 1973, in press.

Whitehurst, G.J., Ironsmith, E., and Goldfein, M. Selective imitation of the passive construction through modeling. Unpublished paper. State University of New York at Stony Brook, 1973.

Whitehurst, G.J., and Vasta, R. Is language acquired through imitation? Unpublished paper. State University of New York at Stony Brook, 1973.

Slide Captions

Slide 1: Typical procedure for imitation training.

Slide 2: Typical procedure for modeling.

Slide 3: Representative subject. Percentage of probe trials on which sentences including the four phrase-types occurred in each condition of the study for Glenn. The dotted lines represent the percentage of the training trials on which the particular phrase-type occurred without the necessity of modeling.

Slide 4: A pair of pictures from the modeling set.

Slide 5: Percentage of probe trials resulting in active and passive sentences (sessions 1-5) and percentage of active and passive sentences comprehended correctly (sessions C-C) by the experimental subjects. The first comprehension session was conducted with former modeling stimuli and the second with former probe stimuli.

Slide 1

Training Picture

Adult: "Tell me about the picture."

Child: "A dog; a cat; a house."

Adult: "No! The dog is chasing the cat under the house."

Adult: "Tell me about the picture."

Child: "The dog is chasing the cat under the house."

Adult: "Good!"

Probe Picture

Adult: "Tell me about the picture."

Child: "The boy is throwing the ball to his friend."

Slide 2

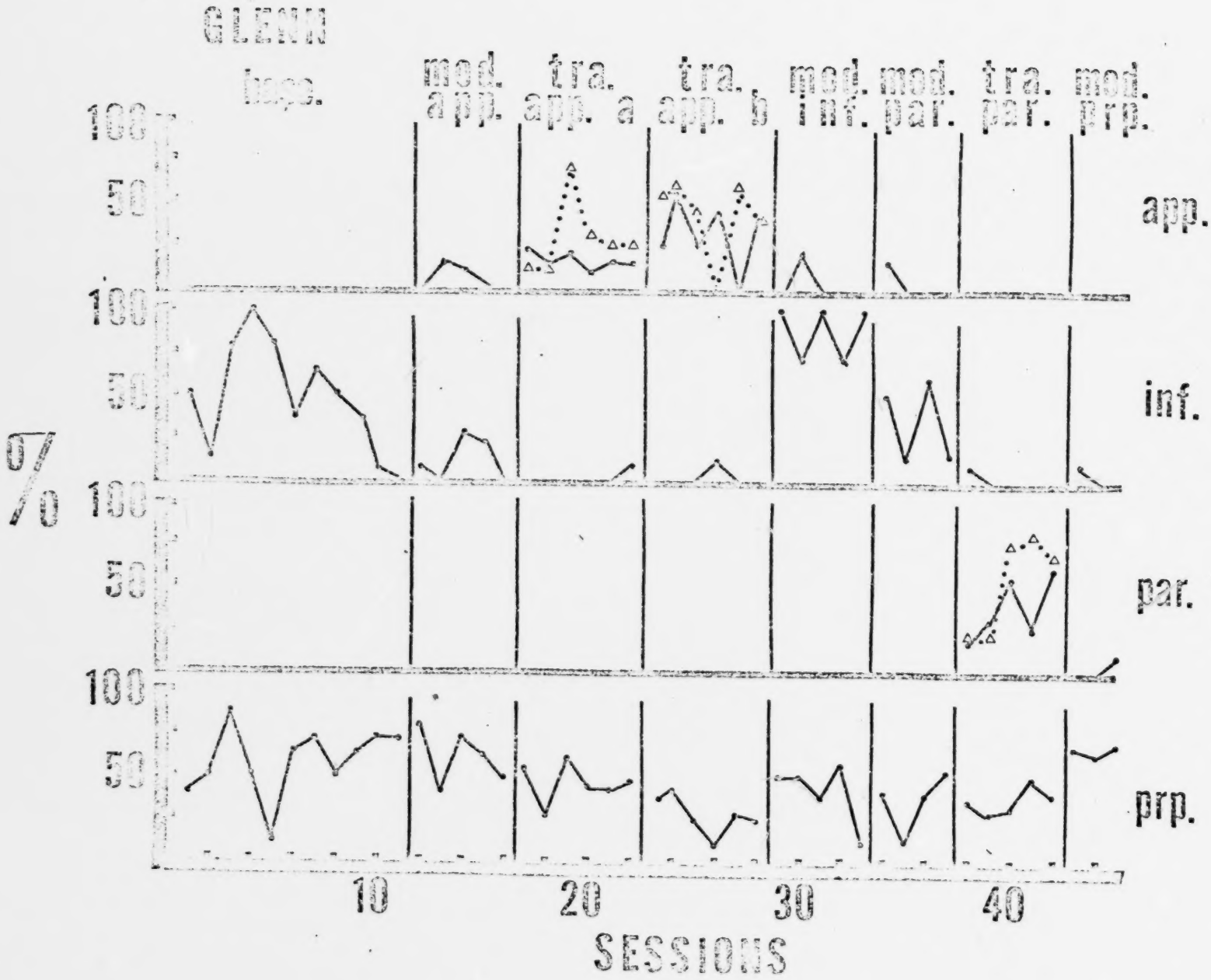
Training Picture

Adult: "The dog is chasing the cat under the house."

Probe Picture

Adult: "Tell me about the picture."

Child: "The boy is throwing the ball to his friend."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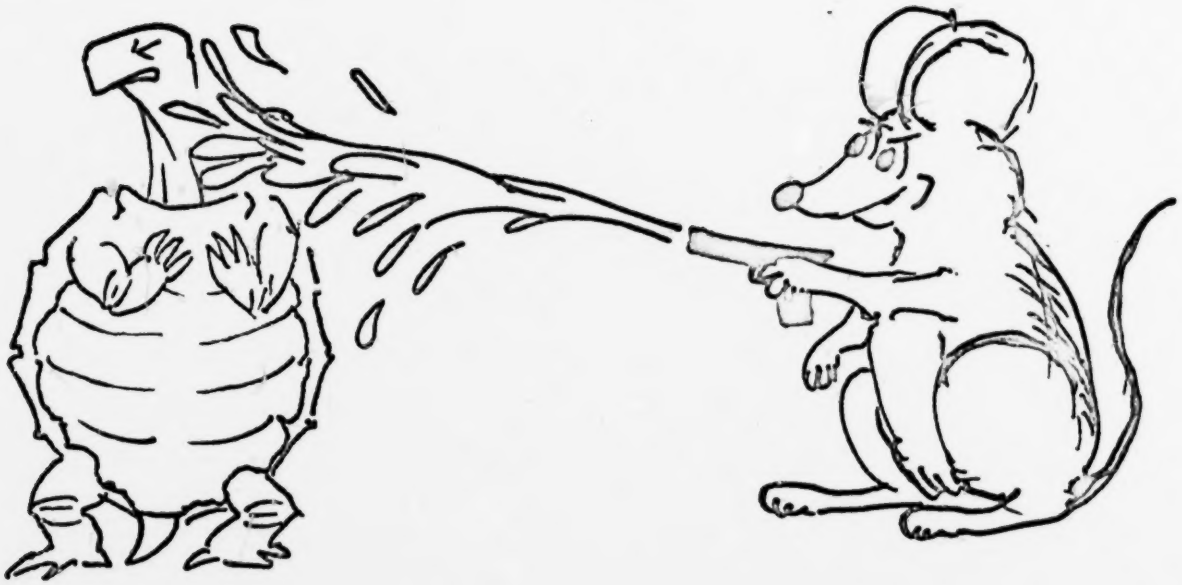

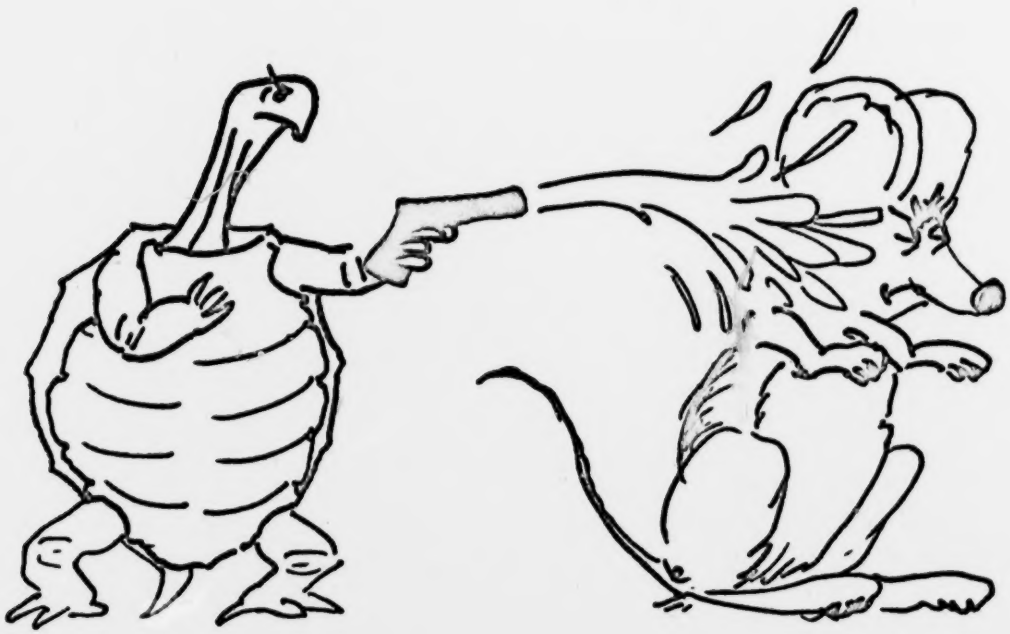

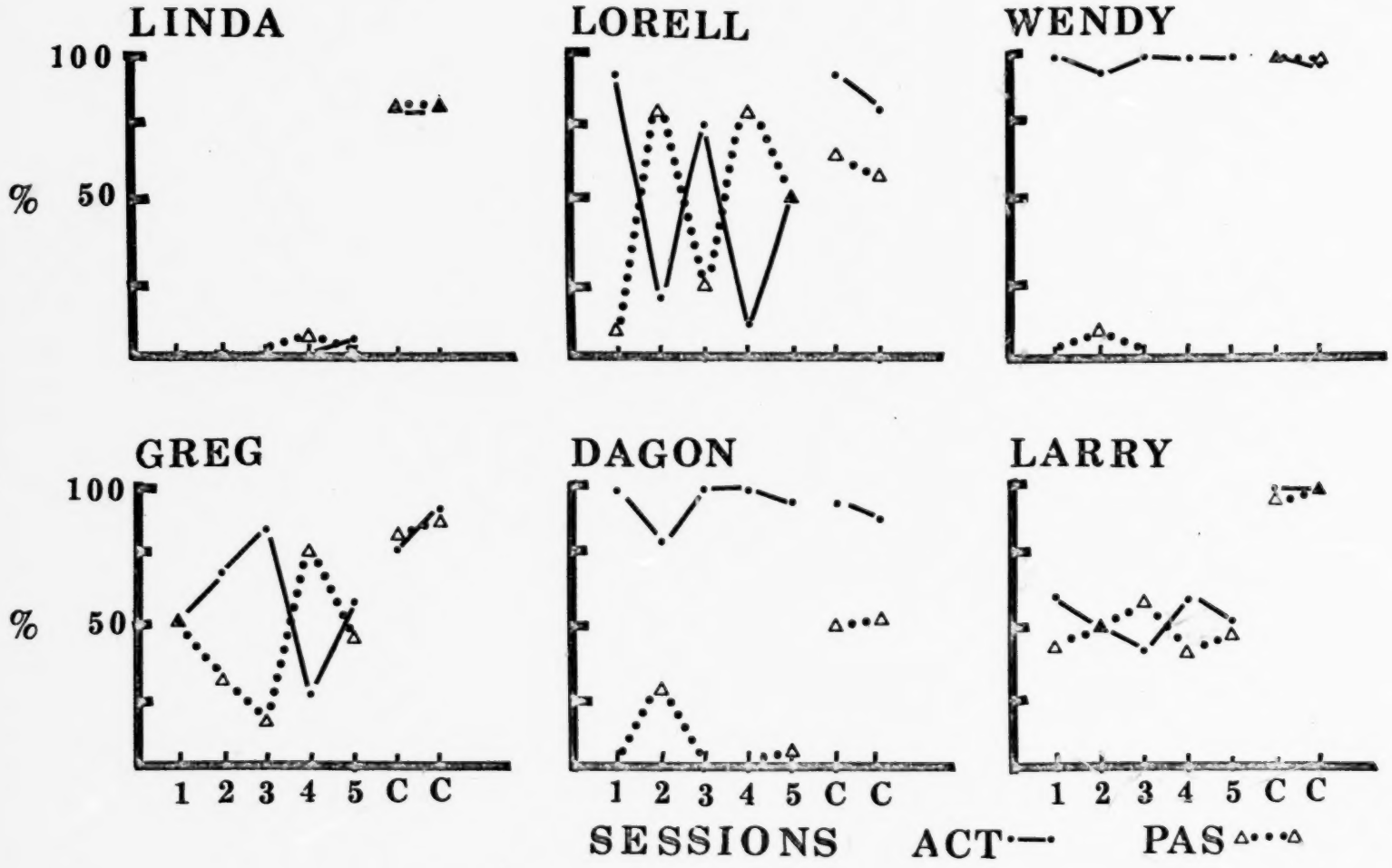
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